

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-261 156

Hazardous Waste Disposal Damage Reports

Environmental Protection Agency, Washington, D C

Jun 76

BIBLIOGRAPHIC DATA SHEET	1. Report No. EPA/530/SW-151.3	2.	3. Recipient's Accession No.
4. Title and Subtitle Hazardous waste disposal damage reports , Document No. 3		5. Report Date June 1976	
7. Author(s)		6.	
9. Performing Organization Name and Address Same as Box 12		8. Performing Organization Rept. No.	
		10. Project/Task/Work Unit No.	
		11. Contract/Grant No.	
12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency Office of Solid Waste Management Programs		13. Type of Report & Period Covered	
		14.	
15. Supplementary Notes A current report on solid waste management			
16. Abstracts This publication is the third in a series of reports to document incidents of improper land disposal of hazardous wastes.			
17. Key Words and Document Analysis. 17a. Descriptors			
17b. Identifiers/Open-Ended Terms			
17c. COSATI Field Group			
18. Availability Statement		19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 19
		20. Security Class (This Page) UNCLASSIFIED	22. Price 3.50

349086

PB 261 156

EPA/530/SW-151.3

JUNE 1976

hazardous waste disposal damage reports

Environmental
401 M Street, S.W.
Washington, D.C. 20004

document no. **3**

a current report on solid waste management

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

An environmental protection publication (SW-151.3) in the solid waste management series. Mention of commercial products does not constitute endorsement by the U.S. Government. Editing and technical content of this report were the responsibilities of the Hazardous Waste Management Division of the Office of Solid Waste Management Programs.

Single copies of this publication are available from Solid Waste Information, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268.

HAZARDOUS WASTE DISPOSAL DAMAGE REPORTS

This publication (SW-151.3), the third in a series of reports to document incidents of improper land disposal of hazardous wastes, was prepared by the Office of Solid Waste Management Programs

U.S. ENVIRONMENTAL PROTECTION AGENCY
1976

HAZARDOUS WASTE DISPOSAL DAMAGE REPORTS

On June 30, 1973, the U.S. Environmental Protection Agency (EPA) submitted a report to the U.S. Congress on the subject of hazardous waste disposal as had been required by the Solid Waste Disposal Act Amendment of 1970.¹ That report concluded that the prevailing methods of land disposal of hazardous wastes are largely inadequate and cited numerous case studies pertaining to improper hazardous waste management. Since the 1973 Report to Congress, EPA has continued to study hazardous waste disposal. A portion of these studies has consisted of more detailed investigations of improper land disposal practices to determine their impact on public health and on the environment. Case studies have been compiled within the framework of these investigations.

The problems associated with improper land disposal of hazardous wastes--unlike the problems of air and water pollution--have not been widely recognized by the public, although the damages may be as severe and difficult to remedy. In addition, the hazardous waste disposal problem continues to become even more significant, as the progressive implementation of air and water pollution control programs, ocean dumping bans, and cancellation of pesticide registrations results in increased tonnage of land-disposed wastes, with adverse impact on public health and the environment. The problem is manifested in ground-water contamination via leachate, surface water contamination via runoff, air pollution via open burning, evaporation, sublimation and wind erosion, poisonings via direct contact and through the food chain, and fires and explosions at land disposal sites.

The objective of publishing these damage reports is to bring about national awareness of the problem, which is essential to its solution. These reports will be published from time to time as resources permit. No systematic effort has been made to concentrate on any one parameter of interest, be it geographical, industrial, type of disposal site, or type of damage. Similarly, it is not the purpose of this series of reports to single out any particular person, firm, or industry. Cases are investigated as information becomes available. The only criteria used in the selection of incidents for these reports are:

- severity of damage
- availability of supporting information
- availability of EPA personnel for investigation

The data base for these damage reports varies widely. In some instances, official public records will be available for documentation; however, in most cases the reports will have to be based on inspection

by EPA personnel, interviews with parties involved or having first-hand knowledge of specific incidents, technical investigations by consulting firms, newspaper accounts, etc.

The authority for the publication of such reports derives from Sec. 204 (a)(1) and (b)(1) of the Solid Waste Disposal Act of 1965 (P.L. 89-272)--as amended by P.L. 91-512, P.L. 93-14, and P.L. 93-611.

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PREVIOUS DAMAGE REPORTS

EPA Publication No. SW-151.2 (December 1975)

Dioxin Poisoning Caused by Improper Waste Disposal in Missouri
Contamination of Groundwater Beneath the Rocky Mountain Arsenal
and Surrounding Area
Dumping into Sand Pit Pollutes Domestic Wells in Texas

EPA Publication No. SW-151 (June 1975)

Arsenic Poisoning in Minnesota
Industrial Waste Disposal on Farmland in Illinois
Fatality at a New Jersey Industrial Landfill

HAZARDOUS WASTE DISPOSAL
DAMAGE REPORT

May 1976

Petrochemical Contamination of the Cohansey Aquifer in New Jersey

1. Personal Damage-None documented.
2. Environmental Damage-Contamination of an unknown portion of the Cohansey Aquifer, a heavily used groundwater table aquifer in the New Jersey coastal plain.
3. Economic Damage-Permanent loss of use of 148 private supply wells as a result of condemnation. The direct monetary costs associated with the incident are estimated at over \$400,000.
4. Cause of Problem-The most likely cause of the problem was the infiltration of contaminants from drummed industrial wastes dumped on a former chicken farm (the Reich property). Many of these drums are known to have leaked before being removed, and at least some of the waste liquid was dumped directly onto the soil.
5. Type and Quantity of Hazardous Waste-At least 4,500 55-gallon drums of liquid chemical wastes, containing a wide variety of petrochemicals with toxic, flammable, explosive, and oxidizing properties.
6. Source of Waste-The Bound Brook plant of the Union Carbide Corporation (UCC). The wastes were hauled to the Reich property by Nicholas Fernicola, an independent hauler.
7. Date of Incident-The drums were dumped between August and December of 1971. In early 1974, contamination of wells in the immediate vicinity became evident.
8. Location-Dover Township (near Toms River), Ocean County, New Jersey.

9. Status-The condemned wells remain closed, and a State-instituted requirement that new wells in an area just outside the condemned zone be drilled to the deeper Kirkwood Aquifer remains in effect.
10. Remedial Action-In April 1972, as a result of a court order, the drums and contaminated soil were removed from the Reich property. When additional drums were discovered in June 1974, these were also excavated, along with the contaminated soil, and hauled away for disposal.
11. Legal Action-On January 31, 1972, a complaint was filed with the Superior Court of New Jersey on behalf of the Reichs against UCC and Nicholas Fernicola. A second complaint was filed by the Township of Dover naming the same defendants. These complaints resulted in a court order that UCC stop dumping or transporting any chemical waste in the Township of Dover and that it remove all chemical wastes and drums from the Reich property. In April 1972, when the area had apparently been cleaned up by UCC, the complaints were dismissed. In an out-of-court settlement with UCC, the Reichs received \$10,000 for damages to their property and were reimbursed for the cost of a new well.

On October 11, 1974, a class action suit was filed by local property owners against UCC. The plaintiffs are demanding \$14 million in compensatory and punitive damages on the grounds that UCC was negligent in its disposal of chemical wastes which contaminated the plaintiffs' ground-water. Litigation has not yet been completed.

The most recent legal action is a suit being brought by the State of New Jersey against UCC demanding that the Company remedy all remaining problems resulting from the incident, cease further violations, and be judged against for compensatory and punitive damages.
12. Narrative*-In March 1971, UCC contracted with Nicholas Fernicola, an independent waste hauler, to remove and dispose of an unspecified number of 55-gallon drums of chemical wastes from its facility at Bound Brook, New Jersey. These wastes were composed of organic wash solvents, still bottoms, and residues from the manufacture of organic chemicals, plastics, and resins. Although some of the drums were taken

* Documentation for this Damage Report was obtained through an EPA-sponsored study (see Reference 2).

initially to the Dover Township Landfill as intended, the bulk was dumped on a former chicken farm belonging to Mr. and Mrs. Samuel Reich, in the Pleasant Plains section of Dover Township. This land was leased to Nicholas Fernicola by the Reichs in August 1971, on the assumption that he was in the drum salvaging business and empty drums would be stored there to allow accumulation of a sufficient quantity to constitute a full load for delivery to ultimate purchasers. A few months later, the Reichs began to notice unusual odors emanating from the leased area of their property and upon inspection discovered that there were thousands of drums of chemicals both buried and strewn about. In December of the same year, they notified Mr. Fernicola and subsequently UCC, and requested that the drums be removed. Getting little response, they contacted the New Jersey State Department of Environmental Protection, which advised them that storage of chemical wastes on private land was outside the jurisdiction of the State and that they should take the matter up directly with the parties involved. This led the Reichs to initiate court action against Mr. Fernicola and UCC. They were joined in a similar action by the Township of Dover which acted on the grounds that the storage of these chemicals constituted a public nuisance and endangered the lives and property of the Township's residents. On January 31, 1972, the court ordered UCC to remove the drums and clean up the premises. The Reichs received an out-of-court settlement of \$10,000 plus compensation for the construction of a new well from UCC for the damages they were claiming. In April, when all the wastes had apparently been removed, the complaints against UCC were dropped. In June 1974, a tip led to the discovery of 51 additional drums in another part of the Reich property and also a trailer containing drummed wastes in a wooded area near Winding River, four miles away. These were also removed by UCC. Some of the drums removed prior to April 1974 were taken to a UCC plant in Ohio for incineration. Other drums were taken to the Rollins-Purle industrial waste disposal facility in Logan Township and the Kin-Buc Landfill* in Edison Township, both located in New Jersey. The additional drums discovered later and the contaminated soil were disposed of at the Kin-Buc Landfill.

The quantity of these wastes actually entering the soil is unknown; however, between 5,000 and 6,000 drums of wastes were hauled away from the site where they had been generated. Since only about 4,500 drums were discovered, those missing are believed to have been deposited in the Dover Township Landfill or poured directly on the Reich property and elsewhere, and the empty drums salvaged. Also, about ten percent of the drums discovered on the Reich property were either partially or completely empty. Presumably, they were full when deposited.

* Subject of a previous Damage Report (see first document in the series).

Early in 1974, about two years after the first discovery of the chemical wastes on the Reich property, some of the residents in the immediate vicinity began having taste and odor problems with their well water. Sampling and analysis performed by the State indicated the presence of petrochemicals in the ppm range in the wells of those complaining, as well as in other wells in the area. These analytical results, the very strong and persistent taste and odor problems associated with the water from some of the wells, and the documented dumping and burial of the chemical wastes at the Reich property led the State Department of Environmental Protection to conclude that the groundwater in at least the immediate vicinity of the disposal site was contaminated with hazardous organic chemicals. The Dover Township Board of Health then passed an ordinance forbidding the use of well water within the contaminated zone for any purpose, permanently condemning 148 private wells, and ordering that they be capped with cement.

During the six-month interim between condemning of the wells and extension of a public water supply line from the Toms River Water Company to the area, emergency water supply was provided through the use of tanker trucks. Some residents and public facilities used bottled water for drinking and cooking. In the area just outside the contaminated zone surrounding the Reich farm, where construction of new wells was still allowed, the State imposed a greater minimum depth for wells in order to tap the underlying uncontaminated Kirkwood Aquifer. This was enforced through the State's already established well drilling permit program.

There are several other waste disposal sites which may contribute to groundwater contamination in that area of Ocean County. These include the Dover Township Landfill at which chemical wastes have been deposited, the Toms River Chemical Corporation plant in Dover Township, and various locations in which unauthorized industrial waste disposal has allegedly taken place. Although these possible sources of groundwater contamination relate to the Cohansey Formation, they do not appear to bear on the Pleasant Plains problem directly.

Monetary damages directly resulting from the contamination of the Cohansey Aquifer, in which the affected wells are located, amounted to more than \$400,000.

The direct damages can be broken down as follows:

Estimated cost of capping the condemned wells.....	44,400
Removal of drums.....	25,750
Interim emergency water supply.....	4,900
Drilling of 20 new wells to deeper aquifer.....	46,000
Cost of sampling and analysis.....	38,900
Extension of public water supply.....	249,100
Construction of observation wells.....	8,300
	<u>\$417,350</u>

Indirect costs, such as the cost to residents in inconvenience and devaluation of property, the time spent by Federal, State and local authorities in dealing with the problem, and possible future spread of the contaminated zone, have not been calculated. While no public health problems appeared to arise from this incident, the possibility of chronic health effects could not be evaluated.

HAZARDOUS WASTE DISPOSAL
DAMAGE REPORT

May 1976

Hexachlorobenzene Contamination of Cattle in Louisiana

1. Personal Damage-None documented.
2. Environmental Damage-Contamination of air, soil, and vegetation over an area of about 100 square miles by a toxic substance.
3. Economic Damage-Expenditure of over \$380,000, including monitoring and enforcement. This amount does not include losses incurred from delayed marketing of about 30,000 head of cattle.
4. Cause of Problem-Most likely cause was the volatilization of hexachlorobenzene (HCB) from landfilled wastes and subsequent bioaccumulation in cattle grazing in contaminated areas. Other possible sources were industrial processing air emissions and practices involving storage of contaminated products and transport of HCB-containing wastes.
5. Type and Quantity of Hazardous Waste-Wastes containing about 15% HCB were generated at the Vulcan plant in the amount of 5,400 tons/year. Because escape of contaminants in the course of production and disposal occurred continuously over a number of years, the total amount of HCB involved in this episode cannot be estimated.
6. Source of Waste-The Vulcan Materials Corporation plant at Geismar, Louisiana, where the manufacture of perchloroethylene (tetrachloroethylene) and carbon tetrachloride produces HCB as a by-product. Several other plants in the area, which manufactured similar products, probably contributed HCB-contaminated wastes to one or both of the landfills at which HCB levels were found to be high.
7. Date of Incident-Contamination of beef was discovered in a routine sample taken in December 1972.
8. Location-A 100 square mile area around Darrow and Geismar, Louisiana.
9. Status-Vulcan Materials Corp. is now burying its wastes on-site and has reduced emissions of HCB into the air to the ppb range. Monitoring for HCB continues.
10. Remedial Action-The two landfills which previously received HCB wastes no longer do so, although one is still in operation. These sites have been covered with 4 to 6 feet of soil, and a

polyethylene film has been placed approximately two feet below the surface. Vulcan's current practice is to temporarily store HCB wastes underwater in a lagoon and subsequently landfill them on-site, utilizing a cover system similar to the one described above.

11. Legal Action-In the spring of 1973, the State of Louisiana ordered Vulcan to landfill its HCB wastes on-site, using plastic and soil as cover. At about the same time, the State obtained a cease-and-desist order directing Vulcan to reduce its air emissions of HCB to below detectable levels (in the ppb range).
12. Narrative*-In December 1972, a routine sample of beef fat taken as part of the U.S. Department of Agriculture's (USDA) Meat and Poultry Inspection Program, showed 1.52 ppm HCB. Until that time, HCB was rarely encountered, and the level found far exceeded the USDA action guideline of 0.3 ppm then in effect. When it was discovered that the sample came from a steer belonging to W. I. Duplessis of Darrow, Louisiana, inspectors from the program returned to the area and took three additional samples from the Duplessis herd. These also showed high levels (0.99, 1.11, 3.07 ppm) of HCB. Further sampling was conducted in the vicinity, and an area of about 100 square miles was found to contain highly contaminated cattle.

The State of Louisiana was notified, and its officials began an investigation to identify the sources of contamination. Initially, a number of HCB sources were thought possible, because in addition to being a by-product of the manufacture of chlorinated solvents, HCB is also present as a contaminant in certain pesticides and is itself a registered fungicide used for treating seed grain and vegetable seeds. Numerous sources were considered but most of them were ruled out in the course of the investigation. Soil and vegetation samples confirmed the area of contamination and showed concentrations of HCB at high levels near the Vulcan Materials Corporation plant at Geismar, the Ascension Parish Landfill (which was receiving Vulcan's wastes), and another landfill operated by Browning-Ferris Industries. Levels as high as 5,000 ppm were found in the soil at the disposal sites, and it was later learned that HCB-containing wastes were being employed as a cover because they were so effective at keeping birds away. Storage areas for products containing HCB appeared to be minor sources, as did the routes along which Vulcan's wastes were transported. Although a Dow Chemical plant in the area was manufacturing similar products, it had instituted a program of incinerating its wastes, and did not pose the problem identified at Vulcan.

* Documentation for this Damage Report was obtained from the internal files of the U.S. EPA Office of Toxic Substances and Office of Solid Waste Management Programs.

The specific mechanism of bioaccumulation of HCB in the cattle has not been determined. It is thought that ingestion (via settlement of HCB on the pastures) and inhalation by the animals were both contributing factors.

At the time of the incident, no tolerance level for HCB had been established and although USDA used an action guideline of 0.3 ppm, this did not have legal force. Therefore, USDA petitioned EPA to establish a tolerance for HCB in livestock products, and the State imposed a quarantine on livestock produced in the 100 square mile area identified earlier. The State also obtained a cease-and-desist order requiring Vulcan to stop emitting HCB into the air during its operations, and to bury its HCB-laden wastes on-site, using a plastic and soil cover.

Based on USDA's action level, 42 percent of the quarantined cattle would have been unacceptable for marketing. The USDA, in its petition, asked that the tolerance level "be established as high as possible, consistent with providing consumer safety." After review of the available scientific literature and consultation with the USDA, the Food and Drug Administration, and appropriate Louisiana State Agencies, EPA recommended an interim tolerance level of 0.5 ppm HCB, finding that the data needed to justify a final tolerance did not exist. The USDA adopted the interim tolerance level, and along with EPA, began the studies needed to establish the final tolerance. This change from the action level to the interim tolerance resulted in a reduction of unmarketable animals to 29 percent.

Initial estimates of losses to be incurred by ranchers were as high as \$3.9 million, based on the assumption that approximately 30,000 cattle would have to be destroyed. This did not occur because levels of HCB dropped with time as the cattle were removed from contaminated areas and fed an uncontaminated diet. Only 27 animals proved unmarketable by the end of 1974, when the quarantine was lifted by the State.

The total direct cost of this incident was in excess of \$380,000, primarily due to monitoring and enforcement costs of \$143,000 and the loss of use of grazing land estimated at \$200,000. The loss due to unmarketable cattle was reduced to \$38,000. Another cost, which has not been estimated, is that resulting from delays in the marketing of about 30,000 head of cattle.

As a result of the incident, a number of HCB-related studies were initiated by EPA and other agencies. One of these has shown disproportionately high plasma HCB levels in people living

in the area of Louisiana where the contamination occurred.³ The highest level encountered in the general population was 23 ppb, and a waste disposal facility worker was found to have a level of 345 ppb. The average level was 3.6 ppb. No toxic symptoms were evident. Two additional recent reports bearing on the subject of this Damage Report are cited among the references.^{4,5}

HCB is a pollutant of concern because it is persistent in the environment and is chemically and biologically stable. It is a crystalline solid, but appears in a variety of forms, including vapor, industrial dust, and suspended particulates in water. Under normal environmental conditions it can sublime into the atmosphere. While not acutely toxic in single doses due to poor transfer through the gastro-intestinal tract (the LD₅₀ being on the order of 10⁵ mg/kg of body weight), continued low-dose exposure to HCB by ingestion or inhalation causes bioaccumulation in animal adipose tissues. This can result in chronic damage to the liver and affect enzymatic function.

An outbreak of HCB toxicity in humans occurred in Turkey during the 1950's. This resulted from the human consumption of HCB-treated feed grain which had been accidentally distributed by the Turkish Government. As many as 5,000 people are believed to have sustained poisoning, 80 percent being children between the ages of 4 and 14. Effects observed included liver deterioration, acute skin sensitivity and blistering, uncontrolled hair growth, and ultimately, tremors, convulsions, and death. Doses were estimated to be 50 to 200 mg/day for a long period of time, with symptoms continuing to appear for several years.

HAZARDOUS WASTE DISPOSAL
DAMAGE REPORT

May 1976

Poison Fumes Overcome Workers at a Maryland Landfill

1. Personal Damage-Six men hospitalized.
2. Environmental Damage-Pollution of the air with hydrogen sulfide.
3. Economic Damage-Medical expenses and loss of work time by those injured. Closing for six hours of nearby plant which manufactures concrete blocks.
4. Cause of Problem-Liberation of toxic fumes when dumping of an industrial waste solution at a landfill resulted in chemical reaction.
5. Type and Quantity of Hazardous Waste-Two thousand gallons of an industrial waste solution consisting of iron sulfide, sodium sulfide, sodium carbonate, and sodium thio-sulfate, along with smaller quantities of organic compounds.
6. Source of Waste-The waste was generated in the manufacture of agricultural chemicals at the F.M.C. Corporation plant in Baltimore.
7. Date of Incident-July 1, 1975.
8. Location-Norris Farm Landfill, near Dundalk, in Baltimore County, Maryland.
9. Status-The landfill is presently in operation and, under Baltimore County order, no longer accepts toxic industrial wastes or any wastes which are likely to endanger the safety of landfill workers or others.

10. Remedial Action-Caustic solution was poured on top of area where the waste had been dumped. The area was subsequently covered with refuse and graded.
11. Legal Action-A citation was issued to the landfill owner, Browning-Ferris Industries (BFI), and its subsidiary, Johnson and Speake, Inc., by the Maryland State Occupational Safety and Health Administration. This has resulted in an appeal by the cited parties, and the case is presently in litigation.
12. Narrative*-On the morning of July 1, 1975, Leroy Grove, a driver for the Johnson and Speake trash hauling firm, picked up a full 2,000-gallon waste storage tank containing industrial waste liquid from the F.M.C. Corporation in Baltimore. This tank is regularly deposited there by the hauler for use in accumulating a waste which results from the manufacture of agricultural chemicals. A chemist at F.M.C. had allegedly checked on the waste liquid before it left the plant and found the pH to be about 13. Upon arriving at the working face of the Norris Farm Landfill (which was receiving both municipal and industrial wastes), Mr. Grove opened the valve to allow the liquid to discharge into a depression atop an earth-covered area of the fill. He noticed that the material was a darker color than usual and as soon as it reached eight to ten feet below where the truck was, the discharging liquid began bubbling and forming a blue smoke. The smoke quickly streamed toward the truck and soon enveloped it, causing the driver to fall to the ground. Several landfill employees who rushed to his aid were also overcome. All five of these men were taken by ambulance to Baltimore General Hospital, and Mr. Grove was admitted in critical condition. The area was then cleared and County firefighters were summoned to clean up the liquid. During the operation, one of the firefighters also became ill and had to be hospitalized.

In order to stop the chemical reaction which was creating the fumes, a 2,000-gallon load of caustic solution was sent from the F.M.C. plant and discharged onto the area where the waste had been dumped. This increased the pH of the liquid on the ground, and the reaction was halted. Analysis of air

* Documentation for this Damage Report was obtained from the records of the Maryland State Department of Health and Mental Hygiene (Division of Solid Waste Control) and the Baltimore County Department of Health.

samples taken at locations around the site before the wastes were neutralized showed 5 to 10 ppm hydrogen sulfide. The area was later covered with refuse and graded. Mr. Grove, the most seriously injured of the men admitted to the hospital, was released five days after the incident, still suffering residual effects.

The fumes which injured the men contained hydrogen sulfide (H_2S), a highly toxic gas which is somewhat denser than air. An analysis of the original waste showed that it does liberate H_2S when acidified, but it is not certain whether the waste liquid came into contact with a substance on the ground at the landfill which lowered its pH, or if it left the F.M.C. plant in an unstable form. A similar occurrence at a landfill in England (March 1975) did result in a fatality. A lorry driver died from the inhalation of H_2S fumes after he discharged his load of sulfuric acid into a ditch which had just received another load of liquid waste.

At the time this incident occurred, the Norris Farm Landfill was receiving an average of 1,800 tons of waste a day, of which a substantial amount consisted of liquids from industrial sources. There was no system for segregating wastes and according to a statement by Mr. Grove, no one ever checked or sampled the wastes he hauled between the time he picked up the material and then dumped it at the landfill. All types of solids and liquids were therefore accepted at the landfill in spite of a Baltimore County code prohibiting the acceptance of "hazardous and special wastes" without consultation with appropriate County officials. Liquids were indiscriminately dumped at the working face or sometimes on the cover over completed fill areas, without recording the specific locations. While the landfill is located just 100 feet from the Back River and contains very large volumes of liquid chemical wastes which can be assumed to be leaching or percolating from the site, the area is already highly polluted from other sources. Consequently, the contribution of this waste disposal site to the pollution of the river and ground-water is difficult to document.

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U S GOVERNMENT PRINTING OFFICE : 1976 O - 309-778